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ABSTRACT

A study of 191 native English speaking working class children in grades two, four, and six was undertaken to investigate the development of reading comprehension of selected pronoun-referent structures. Three linguistic comparisons were made: referent type, reference order, and referent distance. Target sentences were constructed with these features and were embedded into short passages, each followed by questions based on the target structure. It was found that noun phrase pronominal structures were easier to comprehend than sentential pronominals, structures with forward reference were easier to comprehend than those with backward reference, and there was no significant difference between inter-sentential structures and intra-sentential structures. A hierarchy of acquisition of reading comprehension was constructed for the various pronoun-referent structures. (Author/TJ)

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CENTER FOR THE STUDY OF READING

Technical Report No. 117

READING COMPREHENSION OF PRONOUN-REFERENT STRUCTURES BY CHILDREN IN GRADES TWO, FOUR, AND SIX

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Abstract

Native English speaking working class children in grades two, four, and six served as subjects in a reading experiment designed to understand the development of comprehension of selected pronoun-referent structures. Three linguistic comparisons were made: (1) Along the dimension of Referent Type, a comparison was made between pronoun-referent structures in which the referent is a noun or noun phrase versus structures in which the referent is a clause or sentence. (2) Along the dimension of Reference Order, a comparison was made between structures in which the pronoun follows its antecedent (Forward Reference) versus structures in which the pronoun precedes its referent (Backward Reference). (3) Along the dimension of Referent Distance, a comparison was made between structures having the pronoun and referent within the same sentence versus structures in which the pronoun and referent are located in separate sentences. Target sentences were constructed with these features and were embedded into short passages each followed by questions based on the target structure. Analyses of variance demonstrated that (1) Noun phrase pronominal structures were easier to comprehend than sentential pronominals; (2) Structures with forward reference were easier to comprehend than those with backward reference; (3) There was no significant difference between intra-sentential and inter-sentential structures. A hierarchy of acquisition of reading comprehension was constructed for the various pronoun-referent structures.

Reading Comprehension of Pronoun-Referent Structures by Children in Grades Two, Four, and Six

The study of children's language and literacy development for several decades has been influenced by research in theoretical linguistics. A tradition of applied linguistics in the area of the relationship between orthography and speech as it affects beginning reading has already been established (Bloomfield, 1942; Chomsky, 1970; Fries, 1963; Read, 1975; Venezky, 1967). However, reading should not be viewed as only the process of sounding out spelling patterns. Reading is a process of communication between author and reader, involving the interaction of their knowledge, experience, syntax, and phonology (Anderson, 1977; Goodman, 1970; Rumelhart, 1977; Smith, 1970). Fluent reading thus occurs when the reader uses his knowledge of the world and awareness of the structure of his language in making predictions about the author's intended message and in acquiring information from the text. However, in learning to read, the child discovers the connection between oral and written language, and learns how written discourse is structured. Syntactic aspects of a passage play a crucial role in facilitating or preventing comprehension, especially for younger readers.

The purpose of the present study is to demonstrate the effect of pronoun-referent structures on children's development of reading comprehension. The present study focuses upon children's comprehension of structures with the pronoun "it." In each of three grades--two, four, and six--the following comparisons have been made. The first is between structures involving two referent types: pronoun-referent structures where

the pronoun refers to a noun or noun phrase versus pronoun-referent structures in which the pronoun refers to a clause or sentence. Examples of these structures are listed in (1) and (2), respectively.

(1) John and his father wanted to buy a large train set, because it was on sale.

(2) Mary rides her skate board in the busy street, but Marvin does not believe it.

The second comparison is between two reference orders: pronoun-referent structures in which the pronoun follows its referent versus pronoun-referent structures where the pronoun precedes its referent. Examples of the former type are also the sentences in (1) and (2) above. Examples of the latter are listed in (3) and (4).

(3) Because it was on sale, John and his father wanted to buy a large train set.

(4) Marvin did not believe it, but Mary rides her skate board in the busy street.

The third comparison was made on the dimension of referent distance: pronoun-referent structures where the pronoun and referent are located within the same sentence versus structures where the pronoun and referent are in separate sentences. Examples of the intra-sentential pronoun-referent structures are already listed in (1) - (4). An example in which the pronoun and referent are located in separate sentences is (5).

(5) John Boy and Mr. Walton went hunting for the rattle-snake in the woods. Mr. Walton was almost bitten by it.

In the experiment the validity of three hypotheses were tested:

Referent Type: Passages of text where the pronoun refers to a noun or noun phrase will be easier to comprehend than passages in which the pronoun refers to a clause or sentence.

Reference Order: Passages with forward reference order, where the pronoun follows its referent, will be easier to comprehend than those with backward reference order, where the pronoun precedes its referent.

Referent Distance: Passages with intra-sentential pronoun-referent structures will be easier to comprehend than passages with inter-sentential pronominal structures.

These comparisons will shed light on the nature of the development of reading across the middle grades, on the nature of the role of syntax in learning to read, and on the nature of selected anaphoric structures on language comprehension.

Research Studies

Linguistic studies on children's language and reading comprehension have yielded findings about the role of syntax in reading. A child's inability to comprehend a given passage is often the result of differences between his facility with oral language and the structures and functions of written language (Strickland, 1962; Schallert, Kleiman, & Rubin, 1977). Although most children have acquired their language system before entering school, the comprehension of specific syntactic structures in oral language

have not yet been developed (Chomsky, 1969; Palermo & Molfese, 1972). Some constructions may be problematic for children in the middle grades (Bormuth, Manning, Carç & Pearson, 1970; Lesgold, 1974; Richek, 1976, 1977). Thus, a fruitful area of research is to demonstrate the role of syntactic-semantic variables in children's learning to comprehend written language. The following discussion will briefly illustrate some of the research findings on comprehension of anaphoric structures, an area receiving much attention in linguistic, psycholinguistic, and educational research (Nash-Webber, 1977).

Although children have acquired a significant amount of language competence before entering school, particular pronoun-referent relationships are stumbling blocks for young children. Bormuth et al., (1970) presented fourth grade children with short passages containing anaphoric structures. After reading each passage, children answered a question based on the target syntactic structure. A ranking of difficulty was made: From most difficult to the least difficult, some of the structures were: person pronouns ('Joe left the room. He had . . !'), demonstrative sentential pronouns ('Joe is dead. That leaves two of us!'), demonstrative noun phrase pronouns ('The old dog belongs to Joe. That is his . . !'), pro-verbs with "sd"('John likes Mary. So does Bill!'), pro-clauses with so ('Joe may go. If so, we will . . !'). Lesgold (1974) challenged this hierarchy and produced different results. In order of decreasing difficulty, part of Lesgold's anaphoric structure hierarchy is the following: pro-clauses and pro-verbs with "so," demonstrative noun phrase pronouns, demonstrative clause pronouns,

and personal pronouns. Lesgold attributed the variation in results to the effects of semantic factors, such as background knowledge of the reader. This is no longer a surprising fact about reading: Background knowledge interacts with and often overrides syntactic factors (Rumelhart, 1977; Pearson, 1974-1975; Anderson, 1977).

In a classic study by Chomsky (1969), children between the ages of five and ten were shown to have difficulty in oral comprehension of some syntactic structures, particularly those involving pronominalization. Sentences with forward pronominalization, where the pronoun followed its antecedent, were already acquired by age 6 ("Pluto thinks he knows everything"). However, sentences where the pronoun precedes its antecedent, backward reference, were more problematic. Children at the age of six were generally unable to comprehend orally presented sentences with backward pronominalization, where the pronoun is in the main clause, preceding its referent: "He found out that Mickey won the race." Children at a variety of ages gave inconsistent responses to questions based on backward pronominalized structures where the pronoun is in the subordinate clause, preceding its referent: "After he got the candy, Mickey left." The ability of comprehending forward pronominalized structures orally are well acquired by first grade as indicated by the interpretation by Cole (1974, p. 671) on Chomsky's data (5-6 year olds: 82%; 6-7 year olds: 83%; 7-8 year olds: 83%; 8-9 year olds: 95%; 9-10 year olds: 76%). However, backward pronominalization is problematic (5-6 year olds: 38%; 6-7 year olds: 23%; 7-8 year olds: 29%; 8-9 year olds: 40%; 9-10 year olds: 53%).

While Chomsky (1969) demonstrated that not all syntactic structures in oral language are comprehensible to young school age children, Richek (1977) demonstrated that some specific pronoun-referent structures contribute to difficulty in written language comprehension. Richek compared the relative difficulty of structures in a three-way paraphrase alternation:

Noun: John saw Mary and John said hello to Mary.
Pronoun: John saw Mary and he said hello to her.
Null: John saw Mary and said hello to her.

For third grade children in a suburban school district, the noun form of the alternation was easier to comprehend than the pronoun form, which in turn was easier than the null form. This illustrates the effect of pronominalization and deletion on the comprehension of written language.

The preceding discussion examined the tradition in which the present study was conducted.

Method

Materials. Target structures were constructed by combining the features of reference: Referent Type (NP, S), Reference Order (FW, BW), and Referent Distance (Intra-S, Inter-S). A set of experimental passages were constructed according to the paradigm listed in Figure 1. Four passages

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Insert Figure 1 about here.
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were constructed for each of the cells down a column in the design matrix: the target pronoun referring to a noun phrase within a sentence, pronoun referring to a noun phrase across sentences, pronoun referring to a clause within a sentence; pronoun referring to a clause

across sentences. Parallel passages varying with the feature of forward versus backward reference order were designed for each of these. Parallel passages contained the same content in order to control for background knowledge effects. Each pronoun had two distractor referents in addition to the correct antecedent. Examples of each passage structure are listed in Table 1.[1]

Insert Table 1 about here.

The parallel passages varying in forward and backward reference were alternately assigned to two forms of test booklets. Thus, each booklet had eight forward and eight backward reference order structures; but no booklet had two versions of the same story. Each passage was printed on a half sheet of colored paper and followed by an identical colored page with a question requiring the subject to respond with the referent. Colors of the passages were alternated in order to help the younger children realize that there were two pages to an item and to prevent skipping of pages. Two random orders of the stories were selected for each of the two booklets. Both forms of the booklets were then alternated in bundles.

Subjects. Native English speaking children in grades 2, 4, and 6 served as subjects. The three schools in which the experiment took place serve a predominantly "blue collar" or working class community in East Central Illinois. Protocols of subjects speaking Black English Vernacular or Latino English were not included in the sample for analysis. Likewise, protocols of second graders reading below grade level were eliminated

on the basis of teacher judgements and/or standardized test scores. This was done in order to assure that the children were able to decode. Furthermore, protocols of fourth and sixth grade children were eliminated if they had below average IQ scores. These actions were taken to assure that all the children in the experiment had enough verbal ability in standard English to perform the task, and to reduce any chance of language or dialect interference.

The total number of subjects in each grade were 55 second graders, 67 fourth graders, and 69 sixth graders. The ratio of boys to girls were 25:29 in grade 2, 27:30 in grade 4, and 34:35 in grade 6. The mean chronological ages of subjects in each grade are seven years and ten months in grade 2, nine years and eleven months in grade 4, and eleven years and eleven months in grade 6. Children in grade 2 have a grade equivalent group mean of 2.9 on the vocabulary section of the Stanford Achievement Test, Primary Level I. On part A and part B of the reading section of the same test, the second graders' group means were 2.7 on each. Fourth graders had mean grade equivalent scores for vocabulary, comprehension, and composite reading on the Stanford Achievement Test, Primary Level III as 4.1, 3.9, and 4.2, respectively. The sixth graders' mean reading ability scores on the Stanford Achievement Test, Intermediate Level II were 5.9 on vocabulary, 6.5 on comprehension, and 6.4 on total reading. Mean scores on the Otis-Lennon Mental Abilities Test for fourth and sixth graders are 106 and 102, respectively.

Procedures. Subjects were generally allowed to remain in their regular classrooms. However, six classes belonging to split grades in one building were regrouped according to grade. This was done to avoid interrupting instruction in grades not involved in the experiment, such as grade 5. One of two experimenters conducted the study within each class. In most cases the classroom teacher remained within the classroom to assist in managing the class.

The subjects in each class were told that the purpose of the experiment was to understand how difficult the storieswere for children in their grade. The subjects were also told that this was not a test on which they would be graded. The subjects were then given the option of performing the task. Experimental booklets were randomly assigned face down to all subjects in a group. After discussing directions, the subjects were told to begin. Although there was no time limit on the task, children were not allowed to look back at a story.

Scoring. A binary scoring procedure was developed in order to distinguish between a response giving the antecedent or paraphrase of the antecedent (correct = 1) and a response giving one of the distractor items or being left blank (incorrect = 0).

Analyses. Means correct for each passage, passage type, and linguistic factor were calculated. Analyses of variance according to Clark (1973) were applied to the data in order to determine effects of the three major linguistic variables--referent type, reference order, and referent distance. Analyses of variance were also applied to the data to examine the effect

of reading ability and grade level on the comprehension of the linguistic factors.

Results

Comparison of means on linguistic variables. The proportions correct within each linguistic variable are summarized in Table 2. For the factor of referent type, passages containing NP pronominal structures have higher

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Insert Table 2 about here.

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scores than passages with sentential pronominal structures (.72 > .56). This same trend occures in each of the three grades: grade 2 (.62 > .44), grade 4 (.73 > .56), and grade 6 (.81 > .69). The reference order factors, forward and backward reference, have overall scores of .70 and .58, respectively, with a relative increase through the grades: grade 2 (.60 > .47), grade 4 (.70 > .58), and grade 6 (.81 > .69). However, comparisons of forward versus backward reference for each story type show variations in the effect on comprehension as illustrated in Table 3. Comparing the

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Insert Table 3 about here.

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passage structure NP(FW, Intra) with the parallel passages with the structure NP(BW, Intra), forward reference has a higher proportion correct than backward reference (.84 > .54). However, within the intersentential structures, NP (FW, Inter) and NP (BW, Inter), the score for both is .75. Comparing the scores on the structure S(FW, Intra) and S(BW, Intra), scores

on forward reference exceeded backward reference (.77 > .62). The scores on passages with the structure S(FW, Inter) is only slightly higher than the scores for S(BW, Inter): .46 > .41.

Comparisons within the third linguistic variable, referent distance, as listed in Table 2, show that the scores are generally higher on intra-sentential reference than on inter-sentential reference (.69 > .59), and that there is an increase across the grades: grade 2 (.59 > .47), grade 4 (.67 > .61), and grade 6 (.81 > .69).

The total proportions correct for identifying the referent of the pronoun increases through the grades as summarized in Table 4 are: grade 2 (.53) < grade 4 (.64) < grade 6 (.75).

Insert Table 4 about here.

Analyses of variance. Analyses of variance were performed on the data according to Clark (1973) and are summarized in Table 5.

Insert Table 5 about here.

Children in the three grades are significantly different in their total scores as indicated by min $F'(2,178) = 21.35$, $p < .01$. This parallels the comparison of means analysis where higher grades had higher scores. The linguistic variable, referent type, is a main factor, min $F'(1,18) = 6.10$, $p < .05$. Thus, passages with noun phrase pronoun-referent structures have significantly higher scores than passages with sentential pronoun-referent structures. The effect of reference order is significant only at the

.05 < p < .10 level with min $F'(1,18) = 4.02$. Recalling the comparison of means analysis, within intra-sentential structures, forward reference order had higher scores than backward reference order. The effect of reference order was weakened by many of the passages containing inter-sentential structures, where the means of inter-sentential structures were similar for forward and backward reference order where the pronoun referred to a noun phrase. The referent distance variable was shown not to be significant, min $F'(1,18) = 2.44$, $p > .10$. Within the noun phrase referent type, scores on passages with intra-sentential structures were less than scores on passages with intra-sentential structures. The opposite trend occurred within the sentential referent type block of passages. This interaction is significant, min $F'(1,18) = 6.60$, $p < .01$.

The preceding analysis of variance involved the variables of referent type, reference order, referent distance, grade level, booklet form (X,Y), and booklet order, the ordering of stories within a booklet. Another analysis of variance (Clark, 1973) was performed and is summarized in Table 6 in order to include reading comprehension. Children in the three grades are significantly different in their total scores on the pronoun

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Insert Table 6 about here.

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experiment, min $F'(2,130) = 24.03$, $p < .01$. Furthermore, there is a significant effect of reading ability within each grade, min $F'(2,53) = 10.40$, $p < .01$. The role of the syntactic reference variables is in the same direction as the previous ANOVA. However, the role of referent type

in this analysis was marginally significant, min $F'(1,4) = 6.64$, $.05 < p < .10$. The role of reference order was shown to be much stronger, min $F'(1,7) = 24.94$. $p < .01$. Yet, the role of referent distance was again nonsignificant, min $F'(1,3) = .92$, $p > .10$. Unlike the previous analysis, marginal interactions occur between reference order and referent distance, min $F'(1,5) = 4.51$, $.05 < p < .10$; and among referent type, reference order, and referent distance, min $F'(1,13) = 3.72$, $.05 < p < .10$.

Discussion

This project was designed to study the effect of three syntactic reference variables on children's reading comprehension in grades 2, 4, and 6. Three specific questions were asked: (1) Will noun phrase pronominals be easier to comprehend than sentential pronominals? (2) Will forward reference be easier to comprehend than backward reference? (3) Will intra-sentential pronoun-referent structures be easier to comprehend than inter-sentential structures? The first hypothesis predicted that passages with noun phrase referent types will have higher scores than passages with sentential referent types. This hypothesis was confirmed in both analyses of variance. The second hypothesis stated that passages with forward reference order will have higher scores than those with backward reference order. This was also confirmed. The third hypothesis claimed that passages containing intra-sentential referent distance would have higher scores than with inter-sentential referent distance. This hypothesis was rejected.

The role of referent type in children's reading. There are several reasons to support the outcome of the first hypothesis. First, sentential

referents are more complex than noun phrase referents in that more information and constituent structure are found in sentences than in noun phrases. Similarly, sentence pronominals probably place a greater toll on memory than noun phrase pronominals. Furthermore, more structure needs to be produced in responding to the stimulus question in recalling sentence pronominals than in recalling noun phrase pronominals. Another explanation may be that sentence pronominal structures are acquired much later than noun phrase pronominals. All these reasons contribute to the role of referent type in children's reading. Yet much more research is needed to understand the differences in complexity and content of each referent type and the demands of these on language performance.

The role of reference order in children's reading. The theory of syntactic processing strategies (Bever 1970) would suggest that pronoun-referent structures where the pronoun follows its antecedent would be more comprehensible than structures where the pronoun precedes its referent. While one would naturally expect fluent adults to be able to comprehend both reference order structures, one would expect young children to comprehend forward reference more easily than backward reference. One explanation is that forward pronoun-referent structures are less transformationally complex than backward pronoun-referent structures (Langacker 1969, Ross 1969). Thus, children learning to comprehend backward referent are expected to have more difficulty even after age five (Chomsky, 1969). While these statements may be true, a stronger explanation rests on the assumption that pronouns are expected to occur in their natural English word order--after their referents. Backward reference often violates a naturalness condition of language (Osgood,

Note 1). Backward reference order is generally difficult to comprehend if the structures violate the predictability requirement (Kuno 1972, 1975): A left hand noun phrase cannot be pronominalized unless its referent is predictable from the previous context. Furthermore, Bolinger (1977) argues against the generative concept of "backward pronominalization" in oral language because he claims that pronouns relate to a noun phrase previously mentioned in discourse or already known by the speaker or hearer. Similarly, Kantor (1977) argues that for the comprehension of pronouns in written language, the reader's expectation of information is crucial. Thus, the reader's knowledge of the rules of discourse governing reference (Kuno, 1972, 1975; Bolinger, 1977; Kantor, 1977) and knowledge of the world (Nash-Webber, 1978) are important elements in reading comprehension. If surface syntactic structure violates the reader's expectation, the structure may be difficult to comprehend. Yet as children learn to be sensitive to discourse factors governing pronoun use and acquire greater syntactic facility, reference order will become less problematic in reading.

The role of referent distance in children's reading. It was hypothesized that intra-sentential pronominal reference would be easier to comprehend than inter-sentential pronominal reference. This assumption was based on the assumption that the 'minimal distance principle' plays a role in language comprehension (Chomsky, 1969; Rickek, 1976). Although this principle in the past applied mainly to deletion phenomena in subordinate clauses, one could extend the principle to cover anaphora. Thus, a minimal distance principle would claim that given a choice of two or more possible referents to a pronoun, the one nearest the pronoun will

most likely be the antecedent. Furthermore, pronoun-referent structures where the co-referents are closer to each other will more easily be comprehended than structures where co-referents are further apart.

The overall effect of the minimal distance principle was shown to be insignificant in the recall of the antecedent after reading a passage. Several factors may have led to this result. First, many of the intra-sentential pronoun-referent structures were not in the same clause, for backward reference is not possible within the same clause (Langacker, 1969). Thus, intra-sentential structures are sometimes inter-clausal. Secondly, this area of the experiment was very difficult to develop and was not easily controllable. Distance was sometimes varied arbitrarily to maintain other syntactic factors. Furthermore, the child's knowledge of the world may be more important than syntactic distance in the comprehension process. More research is needed in this area.

Although referent distance was shown not to have an effect on language-reading performance, there was an interaction of referent type and referent distance. For the noun phrase pronominal structures, scores on intra-sentential reference were lower than inter-sentential reference, opposite to the hypothesis; for sentential pronominal structures, scores were higher on intra-sentential structures than on inter-sentential structures. This suggests that a minimal distance principle may be working only in the passages with sentence pronominals. Yet, an explanation of an opposite effect in the noun phrase pronominals is hard to find.

Children's development of pronoun-referent structures. Children's performance in reading the experimental passages can shed light on the

nature of syntactic development beyond age five. The proportions correct in Table 3 suggest a hierarchy of intrinsic difficulty for the different pronoun-referent structures. The easiest structure to comprehend is NP (FW, Intra). The structures S (FW, Intra), NP (FW, Inter), and NP (BW, Inter) compete for next easiest. Next on the hierarchy is S (BW, Intra). The most difficult of the structures are NP (BW, Intra), S (FW, Inter), and S (BW, Inter). The hierarchy can be found with some variation within each grade as summarized in Table 7. Developmental trends can be found. The

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Insert Table 7 about here.

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structure NP (FW, Intra) tends to be well acquired by grade 2. The structures S (FW, Intra), NP (BW, Intra), and NP (FW, Inter) lag behind the development of NP (FW, Intra), but the structures are well acquired by grade 4, causing little difficulty for children in grade 6. However, the remaining structures --S (BW, Intra), NP (BW, Intra), S (FW, Inter), and S (BW, Inter)--provide substantial difficulty for second graders to read. The structure S (BW, Intra) also is difficult for fourth graders, but it is well acquired by grade 6. The structure NP (BW, Intra) also makes gains between grade 4 and grade 6; yet sixth graders still show difficulty. The structures S (FW, Inter) and S (BW, Inter) give second graders the most difficulty, fourth graders moderate difficulty, and sixth graders some difficulty. Finally, the structure S (BW, Inter) makes the most gains between grades 2 and 4 without much improvement by grade 6.

Although the intra-sentential sentence pronominal structures, in general, lagged behind the intra-sentential noun phrase structures, these are successfully comprehended by the time children enter sixth grade. However, inter-sentential noun phrase pronominal structures develop by grade 6; but the inter-sentential sentence pronominals lagged behind. This may be a result of the fact that inter-sentential backward sentence pronominals are derivationally very complex, if not just rare or non-existent.

A general explanation of the above phenomena can be made in light of the demands of the structures on children's processing, especially their memory capacities (Chai, 1967; Lesgold, 1972). Intra-sentential noun phrase pronominal structures are the easiest because the structures are the the least transformationally complex. For, complexity affects recall (Schlesigner, 1966, Savin & Perchonock, 1965). Furthermore, noun phrase referents are easier to recall than sentences or clauses because of the less structure and less information contained in noun phrases. This explains why the structures NP (FW, Intra), NP (FW, Inter), and NP (BW, Inter) are relatively high on the hierarchy. However, children may have performed better on the NP (BW, Inter) structure than on NP (FW, Inter) for non-syntactic reasons. Factors like knowledge of the world or peculiarities of specific passages containing backward pronoun-referent structures violating discourse constraints may have affected the hierarchy.

To summarize, most pronoun-referent structures show a developmental trend, with the more complex ones generally lagging behind the less complex

ones. Except for a few structures, pronoun-referent structures are generally comprehensible by the time children reach the sixth grade.

The need for future research. A general claim made in this report is that syntactic structure, specifically pronoun-referent structures, affect children's reading comprehension. This does not imply that syntax is the only crucial factor involved in comprehending a pronoun. Nash-Webber (1978) demonstrated the role of inference in comprehending anaphora. Likewise, Lesgold (1974) and Pearson (1974-1975) demonstrated that knowledge of the world can affect the comprehensibility of syntactic structure. Thus, more research is needed to demonstrate when syntax is the contributing factor to passage difficulty and when a knowledge gap is the predominant factor. Some of the research questions which remain are: Under what conditions will the child's knowledge of the world override the difficulty in the structure of a passage? Will the syntactic or textual factors be a problem for young children only when the content is unfamiliar? What is the interaction of syntax, discourse structure, and pragmatics in reading comprehension? At what point do children use pragmatic or discourse clues to comprehend syntactic structures which are unfamiliar to them?

Conclusion

The present study demonstrated that syntactic aspects of anaphora do contribute to readability, that children's facility with comprehension of selected pronoun-referent structures is well acquired by the upper grades, and that syntactic structure plays an important role in children's

transition to skilled reading. While young children may acquire facility with phoneme-grapheme relationships, they may have difficulty comprehending aspects of text structure. Some of these structures may be problematic even through the elementary grades. Teachers, therefore, should become more familiar with syntactic aspects of children's reading. Thus, helping a child comprehend a difficult structure will help him make the transition to fluent reading.

Reference Note

1. Charles Osgood, personal communication.

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Footnotes

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[1]A fuller discussion of the problems involved in controlling syntactic and pragmatic variables in the design of passages is found in Barnitz (1978).

Table 1

INTRA-SENTENTIAL NP PRONOMINAL (FORWARD) NP(FW, INTRA)

John and his father went to the hobby shop to look at things to make and play with. They wanted to buy a large train set, because it was on sale. John also saw a model airplane and a racing car set which cost too much money. John's father told him to wait until next Christmas for some of the toys.

Q: What was on sale?

INTRA-SENTENTIAL NP PRONOMINAL (BACKWARD) NP(BW, INTRA)

John and his father went to the hobby shop to look at things to make and play with. Because it was on sale, they wanted to buy a large train set. John also saw a model airplane and a racing car set which cost too much money. John's father told him to wait until next Christmas for some of the toys.

Q: What was on sale?

INTER-SENTENTIAL NP PRONOMINAL (FORWARD) NP(FW, INTER)

John Boy and Mr. Walton went hunting in the woods. Then John Boy shot a rattlesnake. Mr. Walton was almost bitten by it. They were looking for a night hawk and a grizzly bear when Mr. Walton was attacked. Mr. Walton's family was happy to hear the news that Mr. Walton was not hurt badly.

Q: What was Mr. Walton almost bitten by?

INTER-SENTENTIAL NP PRONOMINAL (BACKWARD) NP(BW, INTER)

John Boy and Mr. Walton went hunting in the woods when John Boy shot it. Mr. Walton was almost bitten by the rattlesnake. They were looking for a night hawk and a grizzly bear when Mr. Walton was attacked. The Walton family was happy to hear the news that Mr. Walton was not hurt badly.

Q: What was Mr. Walton almost bitten by?

Table 1 (Cont'd)

INTRA-SENTENTIAL S PRONOMINAL (FORWARD) S(FW, INTRA)

Steve and Mary are new friends and can tell each other many things. Steve told Mary that he rides his bicycle on the sidewalk. Mary told him that she rides her skateboard in the busy street, but Steve did not believe it. Steve said he enjoys riding his sled down a trash heap in winter. Doing things together is fun for Steve and Mary.

Q: What didn't Steve believe?

INTRA-SENTENTIAL S PRONOMINAL (BACKWARD) S(BW, INTRA)

Steve and Mary are new friends and can tell each other many things. Steve told Mary that he rides his bicycle on the sidewalk. Steve did not believe it, but Mary told him she rides her skateboard in the busy street. Steve said he enjoys riding his sled down a trash heap in winter. Doing things together is fun for Steve and Mary.

Q: What didn't Steve believe?

INTER-SENTENTIAL S PRONOMINAL (FORWARD) S(FW, INTER)

Ann's brother was home on Monday while their mom and dad were at work. They wanted him to finish painting the porch. When they came home for supper, they were very angry because he was still doing it. He had fixed his car and repaired his fishing rod instead. His mom and dad were unhappy.

Q: What was Ann's brother doing when his mom and dad came home?

INTER-SENTENTIAL S PRONOMINAL (BACKWARD) S(BW, INTER)

Ann's brother was home on Monday while their mom and dad were at work. When they came home for supper, he was still doing it. They were angry because he hadn't finished painting the porch. He had fixed his car and repaired his fishing rod instead. His mom and dad were unhappy.

Q: What was Ann's brother doing when his mom and dad came home?

Table 2

Mean Proportion Correct on Major Linguistic Factors

Reference Variable	Grade 2			Grade 4			Grade 6			Total		
	Booklet			Booklet			Booklet			Booklet		
	X	Y	Total	X	Y	Total	X	Y	Total	X	Y	Total
Referent Type												
NP	.61	.64	.62	.76	.69	.73	.85	.77	.81	.74	.70	.72
S	.39	.50	.44	.59	.52	.56	.69	.68	.69	.56	.57	.56
Reference Order												
FW	.58	.62	.60	.76	.65	.70	.84	.77	.81	.73	.68	.70
BW	.41	.52	.47	.59	.57	.58	.70	.68	.69	.57	.59	.58
Referent Distance												
Intra-S	.54	.64	.59	.68	.66	.67	.84	.77	.81	.69	.69	.69
Inter-S	.45	.50	.47	.66	.56	.61	.71	.67	.69	.61	.58	.59

Table 3

Mean Proportion Correct for Each Passage Type

Passage Type	Grade 2			Grade 4			Grade 6			Total		
	Booklet			Booklet			Booklet			Booklet		
	X	Y	Total	X	Y	Total	X	Y	Total	X	Y	Total
NP(FW, Intra)	.77	.74	.76	.81	.86	.84	.92	.93	.93	.84	.85	.84
NP(FW, Inter)	.63	.67	.65	.81	.74	.78	.83	.81	.82	.76	.74	.75
S(FW, Intra)	.63	.72	.67	.80	.71	.76	.91	.83	.86	.78	.75	.77
S(FW, Inter)	.28	.35	.31	.60	.27	.44	.70	.53	.62	.53	.38	.46
NP(BW, Intra)	.34	.50	.42	.54	.50	.52	.76	.57	.66	.55	.52	.54
NP(BW, Inter)	.68	.64	.66	.85	.67	.76	.89	.77	.83	.81	.69	.75
S(BW, Intra)	.42	.61	.51	.58	.56	.57	.77	.77	.77	.59	.65	.62
S(BW, Inter)	.22	.33	.27	.38	.55	.46	.40	.58	.49	.33	.49	.41

Table 4

Proportion Correct on Total Pronominal Performance

Grade	Booklet X	Booklet Y	Composite			Range	Standard Deviation
			Order 1	Order 2	Total		
2	.50	.57	.55	.52	.53	.00 - .88	.11
4	.67	.61	.63	.65	.64	.31 - 1.00	.16
6	.77	.72	.78	.71	.75	.50 - .94	.20
Total	.65	.63	.66	.63	.64	.00 - 1.00	.18

Table 5

Table of Significant Effects: F-Ratios by Subjects (F_1), and F-Ratios by Passages (F_2) and Quasi F-Ratios (Min F')

Source	F_1	F_2	Min F'
Grade	$F(2,178) = 28.41^{***}$	$F(2,32) = 86.07^{***}$	$F(2,196) = 21.35^{***}$
Referent Type	$F(1,178) = 80.27^{***}$	$F(1,16) = 6.60^{***}$	$F(1,18) = 6.10^{**}$
Reference Order	$F(1,178) = 74.42^{***}$	$F(1,16) = 4.25^{*}$	$F(1,18) = 4.02^{*}$
Referent Distance	$F(1,178) = 37.87^{***}$	$F(1,16) = 2.61$	$F(1,18) = 2.44$
Referent Type x Referent Distance	$F(1,178) = 116.66^{***}$	$F(1,16) = 7.00^{**}$	$F(1,18) = 0.60^{***}$
Reference Order x Ref. Distance	$F(1,178) = 51.21^{***}$	$F(1,16) = 2.75$	$F(1,18) = 2.61$
Ref. Type x Ref. Order x Ref. Distance	$F(1,178) = 11.04^{***}$	$F(1,16) = .69$	$F(1,18) = .65$
Grade x Booklet	$F(2,178) = 3.43^{**}$	$F(2,32) = 10.51^{***}$	$F(2,196) = 8.87^{***}$
Booklet x Reference Order	$F(1,178) = 5.05^{**}$	$F(1,16) = .28$	$F(1,18) = .27$
Booklet x Ref. Type x Ref. Order	$F(1,178) = 18.13^{***}$	$F(1,16) = 1.13$	$F(1,18) = 1.06$
Grade x Booklet x Ref. Type x Ref. Order	$F(2,178) = 4.08^{**}$	$F(2,32) = 4.90^{**}$	$F(2,132) = 2.22$
Grade x Booklet x Ref. Order x Ref. Distance	$F(2,178) = 4.28^{**}$	$F(2,32) = 4.55^{**}$	$F(2,114) = 2.21$
Booklet Order	$F(1,178) = 1.56$	$F(1,16) = 4.00^{*}$	$F(1,129) = 1.12$
Booklet x Booklet Order	$F(1,178) = 2.53$	$F(1,16) = 6.78^{**}$	$F(1,132) = 1.84$
Grade x Booklet Order	$F(2,178) = 1.08$	$F(2,32) = 2.83^{*}$	$F(2,191) = .78$
Grade x Booklet Order x Ref. Order	$F(2,178) = 2.55^{*}$	$F(2,32) = 2.71^{*}$	$F(2,115) = 1.31$

$^{*}p < .10$

$^{**}p < .05$

$^{***}p < .01$

Table 6

Table of Significant Effects: F-Ratios by Subjects (F_1), and F-Ratios by Passages (F_2) and Quasi F-Ratios (Min F')

Source	F_1	F_2	Min F'
Grade	$F(2,166) = 27.90^{***}$	$F(2,6) = 173.04^{***}$	$F(2,130) = 24.03^{***}$
Reading Ability Within Grade	$F(2,166) = 15.07^{***}$	$F(2,6) = 33.59^{***}$	$F(2,53) = 10.40^{***}$
Grade x Reading Ability	$F(4,166) = 1.09$	$F(4,12) = 3.56^{**}$	$F(4,123) = .83$
Referent Type	$F(1,166) = 70.50^{***}$	$F(1,3) = 7.33^{*}$	$F(1,4) = 6.64^{*}$
Reference Order	$F(1,166) = 54.69^{***}$	$F(1,3) = 28.28^{**}$	$F(1,7) = 24.94^{***}$
Referent Distance	$F(1,166) = 38.91^{***}$	$F(1,3) = .94$	$F(1,3) = .92$
Referent Type x Reference Order	$F(1,166) = 5.76^{**}$	$F(1,3) = 3.55$	$F(1,8) = 2.20$
Referent Type x Referent Distance	$F(1,166) = 111.57^{**}$	$F(1,3) = 33.02^{**}$	$F(1,5) = 25.48^{***}$
Reference Order x Ref. Distance	$F(1,166) = 44.33^{***}$	$F(1,3) = 10.03^{*}$	$F(1,5) = 4.51^{*}$
Ref. Type x Ref. Order x Ref. Distance	$F(1,166) = 11.94^{***}$	$F(1,3) = 6.84^{*}$	$F(1,13) = 3.72^{*}$
Grade x Referent Distance	$F(2,166) = 2.77^{*}$	$F(2,6) = 1.39$	$F(2,13) = .93$
Reading Ability x Ref. Distance	$F(2,166) = 2.23$	$F(2,6) = 5.25^{**}$	$F(2,56) = 1.57$
Grade x Reading Ability x Ref. Type	$F(4,166) = 2.45^{**}$	$F(4,12) = 1.03$	$F(4,24) = .73$

$^{*}p < .10$

$^{**}p < .05$

$^{***}p < .01$

Table 7

Hierarchy of Difficulty for

Pronoun-Referent Structures for Each Grade

Structure Proportion					
Grade 2		Grade 4		Grade 6	
NP(FW, Intra)	.76	NP(FW, Intra)	.84	NP(FW, Intra)	.93
S(FW, Intra)	.67	NP(FW, Inter)	.78	S(FW, Intra)	.86
NP(BW, Inter)	.66	S(FW, Intra)	.76	NP(BW, Inter)	.83
NP(FW, Inter)	.65	NP(BW, Inter)	.76	NP(FW, Inter)	.82
S(BW, Intra)	.51	S(BW, Intra)	.57	S(BW, Intra)	.77
NP(BW, Intra)	.42	NP(BW, Intra)	.52	NP(BW, Intra)	.66
S(FW, Inter)	.31	S(BW, Inter)	.46	S(FW, Inter)	.62
S(BW, Inter)	.27	S(FW, Inter)	.44	S(BW, Inter)	.49

Figure Caption

Figure 1. Experimental passage design matrix

STRUCTURAL FEATURES
NP(FW, INTRA) INTRA-SENTENTIAL NP PRONOMINAL FORWARD
NP(FW, INTER) INTER-SENTENTIAL NP PRONOMINAL FORWARD
S(FW, INTRA) INTRA-SENTENTIAL SENTENCE PRONOMINAL FORWARD
S(FW, INTER) INTER-SENTENTIAL SENTENCE PRONOMINAL FORWARD

STRUCTURAL FEATURES
NP(BW, INTRA) INTRA-SENTENTIAL NP PRONOMINAL BACKWARD
NP(BW, INTER) INTER-SENTENTIAL NP PRONOMINAL BACKWARD
S(BW, INTRA) INTRA-SENTENTIAL SENTENCE PRONOMINAL BACKWARD
S(BW, INTER) INTER-SENTENTIAL SENTENCE PRONOMINAL BACKWARD

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